The plight of geological collections in the Australian tertiary education system

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Resumo

Um relatório publicado em 1975 identificou as áreas da Geologia e da Antropologia como as que potencialmente geram um maior número de colecções nas universidades australianas. Desde essa ocasião, quer a utilização económica dos recursos energéticos tradicionais quer a procura de recém-licenciados em Geologia tem vindo a diminuir gradualmente. Por outro lado, a reestruturação do ensino superior australiano durante a última década, em particular desde 1996, teve como consequência directa a diminuição de recursos, o que por seu turno colocou em risco as colecções universitárias de áreas que não atraiam um número significativo de estudantes. Os níveis de pessoal são um indicador dos recursos disponíveis para a gestão das colecções e o relatório *Transforming Cinderella Collections* mostrou que, em 1998, oito pessoas apenas tinham a seu cargo um número superior a 1 milhão de espécimens. Apenas quatro anos passados e os níveis de pessoal encontra-se ainda mais reduzidos. De facto, muitas importantes colecções encontram-se hoje sem pessoal responsável e virtualmente inacessíveis. Apesar dos espécimens utilizados directamente no ensino não necessitarem de sistemas sofisticados de gestão da informação, tal não acontece para os espécimens resultantes da investigação fundamental e aplicada. Sem estes sistemas de gestão e sem estratégias claras, é o próprio conhecimento fundamental sobre as ciências da terra na Austrália que está em perigo.

Abstract

A 1975 report identified the areas of geology and anthropology as being the two most likely to develop collections in Australian Universities. Since then Australia has seen a relative decline of the traditional resource-based economy and a lessening demand for geology graduates. Over the last decade, but particularly since 1996, the restructuring of the tertiary education sector has meant that university based collections in areas that do not attract a significant student load, such as geology, are in danger because of a lack of adequate resources for their effective management. Staff levels are an indicator of resources available for management of collections. The 1998 *Transforming Cinderella Collections* report showed some eight staff Australia-wide responsible for just over 1 million specimens. A mere four years from that time and these staff numbers are now much reduced. Many large collections have no staff and are essentially inaccessible. Whilst the large number specimens required for undergraduate teaching do not require advanced information management systems, those that result from basic research do. Without adequate management systems and strategies, the knowledge base of the earth sciences in Australia is at risk.

Introduction

The report *Museums in Australia 1975,* otherwise referred to as the 'Piggott Report'[1], identified geology and anthropology as the two intellectual areas most likely to develop university collections in Australia. In the area of the earth sciences, the report identified the Geology Museum at the University of Queensland (Brisbane) as an excellent example of what can be achieved by a University in terms of collection development and other museum programmes. Geology and anthropology have

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[1] COMMITTEE OF ENQUIRY ON MUSEUMS AND NATIONAL COLLECTIONS 1975. *Museums in Australia 1975: Report of the Committee of Enquiry on Museums and National Collections including the Report of the Planning Committee on the Gallery of Aboriginal Australia.* Australian Government Publishing Service.

traditionally been areas where undergraduate education comprised of a significant practical component involving comparative studies of specimens and objects.

In the 1970s Australia had a strong economic reliance on the minerals and energy sector and there was a strong and consistent demand for earth science graduates. Earth science departments in Australian universities therefore had a considerably high level of graduate throughput and many departments developed their own geological collections to enhance their teaching and learning programmes.

To develop and maintain a strong earth science research capability, the university sector is in a unique position because of its dual role in teaching and research and because of the integration of much postgraduate research into existing and developing research groups. The role that university museums and collections can play in pure and applied research in the area of natural history has been outlined by GIL (2002).

Research can be defined as the 'extension of knowledge,' a term and definition embedded in many university strategic documents. Collections have therefore developed as a direct result of research whereby objects or specimens form the empirical basis of research findings. They have also developed to provide a comparative framework for research investigations. The economic importance to Australia of a strong tertiary education sector in the earth sciences has been outlined in detail elsewhere (e.g. AUSTRALIAN GEOSCIENCE COUNCIL 1992). Many of the geological collections that developed in Australian universities therefore reflect the research priorities, strengths and history of their host university departments.

Not all postgraduate research projects in the earth sciences generate sets of research specimens. The resultant collections, of those that do, will not necessarily end up housed in the institution that fostered the original research. Practices have been variable depending on the individual university. Some university earth science departments will insist that material from original student research is housed in the departmental collection and the student's results not be released until information and specimens are lodged in an acceptable and useable form. Other departments will hold on to research specimens in the first instance, but then lodge them with other collecting agencies when the results of the research are published. In yet other universities, there are no apparent requirements sought from students or their supervisors. On top of this diversity of approaches there is also a diversity of application. In those departments that have established procedures in place that seek to safeguard access to research specimens for future workers, adherence to guidelines often relies on the goodwill of individuals who may have neither the time nor commitment to follow such procedures.

The diversity and apparent ad hoc nature in the management of this issue seems to be an apposite illustration of SPENCER's (1972) contention that a lot of university museums have arrived at their current positions though a series of accidents.

Little was known in general about Australian university museums and collections prior to the establishment of the Council of Australian University Museums and Collections (CAUMAC) in 1990 (SIMPSON 2001). The aim of this group is to identify, represent and promote University museums and collections, to encourage the provision of industry standards for a wide range of visitors and to work cooperatively with all organisations concerned with education, culture and heritage.

In 1995, after some lobbying by CAUMAC, the Department of Employment, Education and Training provided funds for a national investigation into university museums and collections in Australia. This lead to the publication of the first 'Cinderella' report (UNIVERSITY MUSEUMS REVIEW COMMITTEE 1996). This report identified 256 university museums and collections, 21 of them were geological collections. The term 'Cinderella' was derived from the fact that universities and museums in general are funded by different Federal government agencies in Australia. The report found that there were poor levels of awareness amongst university administrators about the collections within their own institutions.

The first 'Cinderella' report stimulated greater interest in Australian University museums and collections and certainly raised the profile of museums and collections with their host institutions. It could, however, be argued that since the initial report improvements have been patchy across disciplines and institutions. This appears to be similar to the situation in the UK. MERRIMAN (2002) indicated that, in the UK there is a dichotomy between museums and collections in the tertiary education sector and the application of common policies may not be possible.

In Australia, there is anecdotal evidence that geological collections have not fared well under the recent changes in university education. These changes and their relevance to the earth sciences are briefly outlined below. This paper aims to quantify one indicator as a measure of change of relevance to university earth science collections.

Recent changes

In recent years (since the mid-1980s) Australian higher education has undergone substantial change. This has encompassed a change to mass higher education, closer alignment with national political objectives and declining levels of public funding.

The changes, particularly rapid in the late 1990s have entailed considerable organisational restructuring. In the sciences, this has often involved clustering of various related academic disciplines into broader administrative units with the objective of reducing costs and fostering interdisciplinary activity. Many geology departments have had their declining staff numbers subsumed into the programmes of environmental science 'divisions' or engineering 'faculties'. The restructuring of the sector has induced what is termed a 'disciplinary flux', i.e. rapid change in the nature of academic disciplines within the sector. "Geoscience as an academic discipline in Australian Universities has been diluted, with geology now most commonly found in mixed administrative units, e.g. together with other physical or biological sciences, geography or environment" (LEGGO 2002: 2).

Apart from the obvious outcome of a reduction in academic programmes, other cost savings available are the reduced number of general or support staff required when a number of academic departments are combined into a larger unit. In Australia, those responsible for the management of geological collections in the university sector have traditionally been general or support staff.

This change has coincided with a fundamental change in the nature of the Australian economy similar to changes throughout the economies in the developed world. Mineral exploration in Australia is at a 20 year low (LEGGO 2002). This is a result of an evolution from industrial and resource-based economies to information-based economies. The decline in exploration has been particularly sharp around the turn of the century as global mineral exploration shifted its geographic focus from the developed world to the developing world, one of the aspects of globalisation.

There are many groups urging that scarce public sector funding in tertiary education needs to be aligned with the emergence of the knowledge economy (e.g CULLEN 1998). The changes in tertiary education have been mirrored in the secondary education system. Thirty years ago senior high school science students could only choose from the traditional science areas of chemistry, physics, biology and geology. Since then there has been a diversification in secondary science study options throughout most states of Australia. Geology has seen the sharpest relative decline in student numbers of all the traditional sciences (DE LAETER & DEKKERS 1997). The decline in government expenditure on tertiary education and adoption of aspects of the 'West report'[2] essentially transfers more of the cost burden to

[2] DEPARTMENT OF EMPLOYMENT, SCIENCE AND TECHNOLOGY 1998. *Learning for Life: Review of Higher Education Financing and Policy.* Canberra. Otherwise known in Australia as the 'West Report'.

students. Student choices are therefore critical to the ongoing viability of some academic disciplines in higher education. As noted by CULLEN (1998: 4), "Universities are an interesting market where the survival of whole disciplines is in the hands of incoming secondary school graduates who may not have even heard of the disciplines they are not enrolling in".

This combination of economic (reduced demand for graduates) and higher education policy (reduced opportunities in traditional sciences for students) has meant declining university enrolments in the geological sciences across Australia.

Earth Science Collections

The most recent published figures available for earth science collections in the Australian University sector are contained in the second 'Cinderella' report (UNIVERSITY MUSEUMS PROJECT COMMITTEE 1998). This report identified 18 geological collections across the sector and included notes on material of national and international significance from within their holdings. The significance assessment was carried out by staff from the relevant universities. This data is presented in Table 1 and includes data concerning numbers of staff directly responsible for the maintenance of these collections. One important recommendation of the

1. University	2. No. of specimens (K)	3. Staff numbers		4. Significance (international)	5. Significance (national)	6. Recognition status
		1998	2002			
ANU	80	1	0	Yes	Yes	Likely
Canberra	6	0.5	0		Yes	
Macquarie	54	0.5	0.5	Yes	Yes	Likely
UNE	250	0	0	Yes	Yes	
Sydney	(100)	0	0			Inactive
UTS	7	0.1	0.1			
Wollongong	20	0.3	0.3		Yes	
Deakin	(10)	0	0	Yes	Yes	
Melbourne	38	0.1	0.1			Under review
Monash	15	0.5	0.5			
RMIT	4	0.05	0.05			
James Cook	80	1	0	Yes	Yes	Likely
UQ	250	1	0	Yes	Yes	
QUT	10	0.1	0.1			
Adelaide	30	0	0	Yes	Yes	
	30	0.45	0.45			Recognised
WA	120	1	0.6	Yes	Yes	
Curtin	13	0.05	0.05			
Total	**1,117**	**7.65**	**2.75**	**8**	**10**	**1**

Table 1 – Australian university earth science collections. Column 1 - universities, ANU = Australian National University, University of Canberra, Macquarie University, UNE = University of New England, The University of Sydney, UTS = University of Technology Sydney, University of Wollongong, Deakin University, The University of Melbourne, Monash University, RMIT = Royal Melbourne Institute of Technology, James Cook University, UQ = University of Queensland, QUT = Queensland University of Technology, University of Adelaide, WA = University of Western Australia, Curtin University. Column 2 – No. of specimens in collection (X1000), note - figures in brackets were not available in 1998 and are the authors' estimate. Column 3 – No. of university staff (or proportion of staff members' time spent) working with collections; 1998 data from *Transforming Cinderella Collections*; 2002 data from survey by author. Column 4 - International significance. Column 5 – National significance. Column 6 Recognition status. (Columns 4-6, data from *Transforming Cinderella Collections*.)

initial 'Cinderella' report (University Museums Review Committee 1996) was to urge universities to develop a set of policies of relevance to their collections. A central issue in policy development was to encourage universities to recognise their collections as important to the strategic future of the institution. It was not envisaged that all collections identified in the first 'Cinderella' report would qualify for recognition by their host institution. Table 1 also includes some indication concerning the recognition issue where such information was available and garnered during the second 'Cinderella' report.

From Table 1 it can be seen that a total of just under eight staff were responsible for the management of over 1 million specimens in Australian Universities in 1998. Ten collections were considered to contain items of national significance while eight of these were considered to contain specimens of international significance. One of the collections at the University of Adelaide, a palaeobotanical collection of Eocene plant specimens, was the only collection in the sector recognised by the host institution. Another three collections considered recognition was likely, one was deemed inactive and another under review.

No staff were available for the management of three collections that were considered to contain items of national and international significance. This includes the University of New England's collections of 250,000 specimens with Antarctic specimens of international significance, Deakin University's collections of type and figured fossil specimens from Australia, Russia, India, China, Thailand and Serbia, and the University of Adelaide's Tate Museum of Geology with type specimens of fossils, specimens from Sir Douglas Mawson's 1929-1930 expedition and mineral samples from mines that have ceased production. It is questionable whether it is in the national interest, or the interests of a future earth science research capacity in Australia, to have such material essentially dormant and unmanaged in the higher education sector. The ratio of staff positions to size of collections shows that in 1998 each staff member in the sector was responsible for an average of approximately 146,000 specimens.

A survey of the staff levels at the same universities in 2002 some four years after the second 'Cinderella' report shows the impact of the decline in earth science tertiary education and the recent round of restructuring within Universities. Staff members have left four positions associated with earth science collections, none of these have been replaced due to financial constraints. One collection (University of Queensland) has been transferred to the State Museum (thus removing approximately 250,000 specimens from the sector). Significantly, two of those staff positions (James Cook and ANU) were attached to collections of significant size and includes specimens of national and international significance. No full time positions remain in the sector. With the exception of the University of Western Australia, all remaining positions are half time or less. The ratio of staff positions to size of collections shows that in 2002 each staff member in the sector was now responsible for an average of approximately 315,000 specimens. None of these collections have been recognised by their host institutions, leaving their fate to be decided by smaller administrative units such as faculties or departments, or alternatively, leaving their fate undecided.

The following trends are self evident. There has been an obvious decline in the resources available for the management of earth science collections in Australian universities as reflected by the lack of filled staff positions. Once these staff leave the system, the burden of maintenance of the collections falls on academic or other staff members or volunteers who may not have the knowledge, expertise or interest in managing the collections effectively.

Decreased specimen requirements for teaching programmes and research will lead to an increase in the number of orphaned collections, and the number of institutions seeking the disposal or de-accessioning of collections. In the absence of any strategic planning from the host institution these collections will inevitably suffer from information loss thus reducing their utility for future teaching and research.

The university sector and the Australian earth science community need to urgently consider the

requirements of future teaching and research programmes in terms of access to specimens and specimen information. Whilst the size of many of these collections is a reflection of active teaching programmes in the past with large numbers of students, of critical importance are those parts of the collections that form the empirical basis of research projects. Institutions need to make significance assessments of their research collections and seek alternative futures for them if they are not deemed to be within the future strategic needs of the university. There is already ample anecdotal evidence of the inability to locate research specimens within universities for projects undertaken during the 1970s and 1980s because many of the collections have been without staff and proper procedures for years. Without an assessment of significance, we run the risk of disposing with the raw data of much scientific endeavour. The situation described by MERRIMAN (2002) in the UK indicated that some collections in the higher education sector have been simply thrown away. Unless we as a nation are to decide that our scientific future does not lie in earth science research, action needs to commence now.

Where to from here?

Concerted action is required in a number of areas to avert a crisis in the availability of raw data for earth science research in the future. Some discussion points are given below.

Significance assessment

All Universities need to establish appropriate disposal pathways for all collections (recognised or unrecognised) that are considered to be of no further relevance or potential for research. Appropriate disposal pathways begin with significance assessment and are followed by seeking out alternative collections in other institutions in order to preserve principles of accessibility in the interests of scholarship. Disposal should only take place after comprehensive documented consultation across the discipline. The development of appropriate mechanisms are the responsibility of the host institution seeking disposal. Ample guidance in significance assessment is available to Universities from their own earth science staff and professional geological and museum organisations. Much valuable specific information of relevance to university museums is available (REYNOLDS *et al.* 2000).

Setting priorities

Once a significance assessment has been undertaken and the host institution has established it no longer sees any strategic value in keeping these collections, it is essential to focus on a range of disposal pathways for different categories of material. The highest priority should be the preservation of information and specimens from published research collections. The second highest priority is the preservation of information and specimens from unpublished research collections. Depending on their significance, both these might be appropriate for the collections of a corresponding state or national museum or some other scientific government agency. Less important tasks are the appropriate de-accessioning of reference collections and the appropriate de-accessioning of teaching collections.

Implementation of policy mechanisms at University level is needed to pursue the resolution of the established priorities. Wide dissemination of information concerning any proposed de-accessioning or disposal, advice from external organisations (e.g. Geological Society of Australia, Australian Research Council, Museums Australia, Australasian Institute of Mining and Metallurgy) and a search for financial resources to adequately fund the process are also essential.

Correct policy settings

The majority of earth science research in Australian universities is funded by the Australian Research Council through a range of competitive grant schemes. There are few guidelines for the sector as a whole in terms of expectations concerning original research materials. One document of relevance is the Joint National Health and Medical Research Council and Australian Vice Chancellors' Committee

Guidelines on Research practice (AUSTRALIAN VICE CHANCELLORS' COMMITTEE 1997). This document includes a section on data storage and retention. Some excerpts are given below:

> "2.2 The Department or research unit must establish procedures for the retention of data and for the keeping of records of data held.
> 2.4 Wherever possible, original data must be retained in the department or research unit in which they were generated." (AUSTRALIAN VICE CHANCELLORS' COMMITTEE 1997: 3).

It is important to remember that these guidelines were developed to be inclusive of digital data as well as objects and specimens from the real world. Whilst the Australian Research Council will assume that universities have adopted the principles in the Australian Vice-Chancellors' statement, merely archiving digital data from specimens would be evidence of compliance. Of more direct relevance are extracts from the 'conditions of grant document' attached to Australian Research Council grants. In particular:

> "15.3 The Institution shall ensure that Chief Investigators: (a) take reasonable care of, and safely store, any data or specimens or samples collected during, or resulting from, the conduct of their Project; (b) make arrangements acceptable to the ARC, for lodgement with an appropriate museum, archive or organisation in Australia of any data or specimens or samples collected during, or resulting from, a Project; and (c) where practicable, lodge materials within two years of the conclusion of any fieldwork relating to the Project research. Details of the lodgement are to be included in the Final Report for the Project. Chief Investigators not intending to lodge the material within the two-year period should include an explanation in their Final Report." (AUSTRALIAN RESEARCH COUNCIL 2001: 8).

It is worth remembering that the Australian Research Council (ARC) is a research funding body with roles in policy, funding and promoting collaboration. The ARC is not established or funded to be involved in research management, including the management of primary data sources.

The funding programmes for research supported by the ARC are periodically reviewed. In a review of the discipline areas of sedimentology, stratigraphy and palaeontology the problem of the management of primary data sources, in particular specimens, was identified in Recommendation 8:

> "Universities should be encouraged to provide more assistance for curatorial work" (AUSTRALIAN RESEARCH COUNCIL EVALUATION PROGRAM 1995: 31).

The Council's response to this recommendation was that "Universities are in a better position than the ARC to address this recommendation" (AUSTRALIAN RESEARCH COUNCIL EVALUATION PROGRAM 1995: x).

Even though the ARC is not concerned with management of research data, some simple policy settings can close this gap. For example, proposals for research projects to be funded by the Council, or any other funding agency, that generate collections should entail a component for appropriate storage and documentation in the original project application. This point has been made publicly before[3].

Look to international experience

This issue is not isolated to Australia or the university sector, but is a world-wide phenomenon related to advances in information technology and globalisation. In the USA there is a critical shortage of space for current geoscience collections and data, let alone for those collected in the future (STOTSKAD 2002). This prompted a national investigation (NATIONAL ACADEMY OF SCIENCES 2002). This report recommended that whilst everything was not worth saving, investment was required in some new storage centres and key advisory committees should be urgently formed to evaluate the significance of specimens under threat.

Furthermore, the report found that a huge amount of geological specimens, funded by public money, were regularly discarded routinely after fulfilling only a small part of their research potential. Many existing collections were stagnant or poorly maintained despite the vast expense in their original acquisition.

In the USA this issue has taken over 10 years to develop to the point where a national investigation was initiated (MIKULIC & KLUESSENDORF 2002). In the Netherlands the fate of unused geological collections

3 This point was made by Professor Mary O'Kane in a keynote address at the 1996 CAUMAC Conference in Adelaide (SIMPSON 1996).

in the higher education sector has been examined and strategies developed over a similar period of time. (CLERCQ, this issue). In Australia, discussion of the status of our geological collections in the higher education sector has just begun.We need to examine the strategies developed from the experiences in other nations to inform the development of our own.

Acknowledgements

My interest in this issue stems from a former position as Curator of the Geology Museum at the University of Queensland. This collection is the only one in Australia to be transferred under deed of agreement to the state museum (Queensland Museum). This experience fostered this research across the higher education sector in Australia. I thank members of the Council of Australian University Museums and Collections (CAUMAC) and their parent body, Museums Australia, for their support and encouragement in this endeavour. I thank Peter Stanbury and Steven de Clercq for valuable background discussion on the issues raised in this paper.

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